ATTACHMENT

IMPACTS OF 1993 MODEL ENERGY CODE ON RESIDENTIAL BUILDINGS IN MARYLAND

AUGUST 3, 1995

Financial and Economic Assumptions

The financial and economic parameters required for input to this analysis are summarized below. These parameters are used to calculate the costs and benefits from the homeowner's perspective.

C new home mortgage parameters
- 8.0% mortgage interest rate
- points and loan fees equal to 1.6% of the mortgage amount
- 30 year loan term
- down payment of 20% for single-family, 10% for multifamily

C other rates and economic parameters
- marginal federal income tax of 28% for single-family, 15% for multifamily plus state income tax of 7.5%
- property tax of 1.1%
- 3.9% inflation

Fuel Prices

From the consumer's perspective, the energy cost savings from changes in energy-efficiency levels are driven by marginal fuel prices, which may not equal average fuel prices. The fuel prices used in the analysis are shown in the Table 1 below. Electricity prices for Hagerstown are from 1993, I have not been able to obtain more current prices. The oil price is a state average. Fuel prices are assumed to increase at the general inflation rate of 3.9%.

Table 1. Fuel Prices by City

City	Natural Gas ($/therm)	Fuel Oil ($/gal)	Electricity ($/kWh)	
			Heating	Cooling
Baltimore	0.485	0.85	0.047	0.119
Hagerstown	0.515	0.85	0.060	0.060

Complying Measures for ASHRAE Standard 90A-1980 and the 1993 MEC

This economic analysis considers the cost effectiveness of the MEC thermal-envelope requirements. The envelope components considered in the analysis are ceilings, above-grade opaque walls, windows, doors, and basements with wall insulation. Table 2 shows insulation levels and window types corresponding to ASHRAE 90A-1980 and 1993 MEC compliance for the single-family and multifamily dwellings. Complying packages of measures shown in Table 2 were selected utilizing software known as "MEC*check*™" (Version 2), which notifies the user if a set of insulation and window measures complies with the MEC and allows tradeoffs across all building components. Note that other methods of compliance can be chosen, e.g., low-emissivity (low-E) glass may not be needed if more ceiling and/or wall insulation is used.

Table 2. Energy-Efficiency Measures for ASHRAE Standard 90A-1980 and 1993 MEC

	Ceiling Insulation	Wall Insulation	Window Type	Basement Insulation
ASHRAE Standard 90A-1980	R-19	R-11	Double vinyl or wood	None
1993 MEC				
Baltimore				
Single family	R-30	R-13 batt	Double vinyl or wood	R-10, 4 ft. deep
Multifamily	R-19	R-11 batt	Double vinyl or wood, with low-E	R-0
Hagerstown				
Single family	R-30	R-11 batt	Double vinyl or wood, with low-E	R-10, 4 ft. deep
Multifamily	R-19	R-11 batt	Double vinyl or wood, with low-E	R-0

Cost Data

The analysis to determine the cost effectiveness of the MEC in Maryland requires information on the costs of insulation and window measures to meet ASHRAE Standard 90A-1980 and the 1993 MEC. Cost data was obtained from and 1995 Means Residential Cost Data (1994) and 1995 National Construction Estimator (1994), except for windows, where the cost of low-E coatings on double-paned windows was estimated to be $\$1/ft^2$. Costs for multifamily prototype were assumed to be 5% lower than those for single family (NAHB 1986).

Prototype Dimensions

A two-story, single-family house, with dimensions of 28 ft wide and 40 ft long, with a conditioned floor area of 2240 ft^2, was assumed in this analysis: 8-ft-high ceilings; ceiling area (bordering the unconditioned attic) of 1120 ft^2; gross exterior above-grade wall area of 2176 ft^2; and basement wall area of 1088 ft^2. A total door area of 56 ft^2 (approximately 3 doors) was used. For the single-family analysis, a window area of 14% of the wall area (305 ft^2, or 13.6% of the conditioned floor area) was assumed.

The multifamily prototype was assumed to be a 1300-ft^2 2-story townhouse in a 6-unit building. Each unit was assumed to be 20 by 32.5 ft, with the dimensions of the 6-unit building being 120 by 32.5 ft. Assuming 8-ft-high ceilings, the average gross exterior wall area per unit is 813 ft^2. Because multifamily units often have relatively little exterior wall area, the percentage of the wall that is windows tends to be higher than that for single-family houses. The prototype is assumed to have a window-to-wall area percentage of 20%. This gives 163 ft^2 of window area, equivalent to 12.5% of the floor area. The door area is assumed to be 40 ft^2, which equates to approximately 2 exterior doors.

References

Craftsman Book Company (Craftsman). 1994. *1995 National Construction Estimator*. Carlsbad, California.

R. S. Means Company, Inc. (Means). 1994. *Means Residential Cost Data--1995*. Kingston, Massachusetts.

National Association of Home Builders (NAHB). 1986. *An Economic Data Base in Support of SPC 90.2: Costs of Residential Energy, Thermal Envelope and HVAC Equipment*. NAHB Research Center, Upper Marlboro, Maryland.